Endogenous Average Cost Based Access Pricing[1]

Kenneth Fjell

Norwegian School of Economics and Business Administration

kenneth.fjell@nhh.no

Øystein Foros

Norwegian School of Economics and Business Administration

oystein.foros@nhh.no

Debashis Pal

University of Cincinnati, Ohio, U.S.A.

debashis.pal@uc.edu

JEL classi…cation: L51, L90, M41

Keywords: Access regulation, Competition, Non-Discrimination

Abstract: We consider an industry where a downstream competitor requires access to an upstream facility controlled by a vertically integrated and regulated incumbent. The literature on access pricing assumes the access price to be exogenously …xed ex-ante. We analyze an endogenous average cost based access pricing rule, where both …rms realize the interdependence among their quantities and the regulated access price. Endogenous access pricing neutralizes the arti…cial cost advantage enjoyed by the incumbent …rm and results in equal or higher consumer surplus. If the entrant is more e¢cient than the incumbent, then the welfare under endogenous access pricing is also higher.

[1]We are grateful to Kåre P. Hagen and Kurt Jörnsten for valuable discussions. Furthermore, we gratefully acknowledge …nancial support from the Research in Economics and Business Administration, Norway.

1. Introduction

In many regulated industries, such as the telecommunications industry, downstream competitors require access to an upstream essential facility controlled by a vertically integrated incumbent. Usually the essential facility is some costly infrastructure, such as the local loop in telecommunications or the power distribution network in electricity. Typically, ex ante regulatory directives are used to ensure downstream competitors' access to the upstream facility.[2] For telecommunications in the European Union (EU), this is set forth in the Access Directive (2002) which provides National Regulating Authorities with a set of remedies including a transparency obligation (Article 9), a non-discrimination obligation (Article 10), an accounting separation obligation (Article 11), an access obligation (Article 12), and a price control and cost accounting obligation (Article 13).[3] In the United States, the Telecommunications Act of 1996 authorizes new entrants to lease parts of the incumbent …rm's communications network.

To achieve the …rst best welfare outcome, the regulated access price should typically equal marginal cost of providing the infrastructure (see, for example, La¤ont and Tirole, 1994). However, given the cost structure of most regulated sectors, this pricing rule would not lead to full recovery of …xed costs. Hence, much of the economic literature departs from marginal cost based pricing (see Armstrong, 2002, for a review). For example, in the access literature, the recovery of …xed costs is typically advocated to take place through a Ramsey markup of marginal cost.

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[2] This is often referred to as one way access, as opposed to two way access (interconnect), where each …rm is in a position of granting access to its rivals (e.g., both own infrastructure, or have an installed base of customers which other …rms may desire access to). See Armstrong (2002) for an overview.

[3] See European Regulatory Group. ERG, 2003.

More common in practice, and also in the regulation of access in telecommunications, however, is an allocation based on service volume, where the access price is based an average total cost rather than marginal cost. Fully distributed cost (FDC), where historic common costs are allocated primarily on the basis of volume, has been widely used. Long Run Average Incremental Costs (LRAIC) is currently being considered as an alternative. Di¤erent approaches are used to compute a forward-looking access prices. However, they all compute an average cost. In the U.S. the standard is known as TELRIC[4] (see e.g. Mandy and Sharkey, 2003), while the EU uses the term LRAIC. Thus, a transition from FDC to LRAIC may change the common cost measure, but not the principle that the access price is based on average costs. In practice, almost all regulatory cost allocation methods, including FDC and LRAIC, are based on average costs, such that the access price is set above the short-run marginal cost (La¤ont and Tirole, 2000, and Vogelsang, 2003). Thus, the average costs based access pricing rules remain popular despite economists' critique (see, e.g., La¤ont and Tirole, 1996, 2000) and the availability of more sophisticated methods such as Ramsey pricing (see, e.g., La¤ont and Tirole, 1994 and 2000) and the e¢cient component pricing rule (see, e.g. Baumol and Sidak, 1994, and Armstrong, Doyle, and Vickers, 1996).

In general, an exogenously set average cost based access price gives rise to con‡icts among the incumbent …rm that owns the infrastructure and the rivals that lease the infrastructure from the incumbent. The incumbent prefers a higher, whereas the rivals prefer a lower access price. The consequences of an exogenous

[4] Total Element Long Run Incremental Cost.

access price in excess of marginal cost in an oligopolistic market have been studied by several authors. For example, Damania (1996) shows that in a homogeneous product Cournot duopoly where only one …rm is vertically integrated, an exogenous access price exceeding marginal cost results in the integrated …rm dominating the market. Biglaiser and DeGraba (2001) assume product di¤erentiation a la Hotelling (1929) in a downstream duopoly setting two-part tari¤s. They show that allowing the upstream monopolist to integrate downstream improves consumer welfare as well as overall welfare relative to when both downstream …rms are independent. Like in Damania (1996), the vertically integrated …rm attains a larger market share than its rival.

To eliminate the advantage that would otherwise be enjoyed by the incumbent, regulations often require access price to be non-discriminatory with accounting separation and transparency used to ensure "that third party access seekers are treated no less favorably than the operator's internal divisions" (ERG, 2003, p. 49). Such an array of regulations (e.g, Articles 9 - 13 in the EU Access Directives), however, gives rise to monitoring and enforcing costs, and therefore creates a signi…cant source of welfare loss.

In this paper, we propose and analyze an endogenous average cost based access pricing rule, where both the regulated …rm and its rivals realize the interdependence among their output and the regulated access price. In contrast, the existing literature on access pricing has always assumed the access price to be exogenously …xed ex-ante. Under an endogenous average cost based access pricing, the access price is determined by dividing the incumbent's …xed cost by the actual aggregate quantities of the …rms. It seems reasonable to assume that …rms will

realize the impact of their own output decisions on an FDC based access price, i.e. on the share of …xed costs each …rm will end up covering.

An endogenous average cost based access price can be easily implemented in practice. The access price determination mechanism and a tentative access price can be announced ex-ante, with the understanding that the …rms may have to pay more or they may receive money back ex-post according to the access price determination mechanism. A simple option of adjusting the access price ex-post transforms an exogenous access pricing regime to an endogenous access pricing regime. Furthermore, under complete information, the ex-ante tentative access price can easily be computed, such that it would be identical to the ex-post access price, and therefore, the …rms would pay or receive nothing ex-post.

Furthermore, we demonstrate that endogenous access pricing has several advantages over exogenous access pricing. We establish that: (i) Endogenous access pricing fully neutralizes the arti…cial cost advantage otherwise enjoyed by the incumbent …rm due to the wedge between the access price and the upstream marginal cost. (ii) The aggregate quantity and the consumer surplus under endogenous access pricing are equal to or larger than those under exogenous access pricing. (iii) If the entrants are no less e¢cient than the incumbent, then the welfare under endogenous access pricing is equal to or larger than the welfare under exogenous access pricing.

Our work is distinct from, but closely related to Sappington (2005). Sappington (2005) considers a similar framework (but with price competition, as opposed to quantity competition downstream) and analyzes whether an entrant would build

its own infrastructure or lease it from the incumbent. Sappington (2005) demonstrates that the entrant's make or buy decision is independent of the access price set by the regulators. Our work is distinct from Sappington (2005), since we assume that duplicating the essential infrastructure is prohibitively costly, and thus concentrate on designing a superior access pricing mechanism. Hence, our approach is more appropriate for network components (e.g. the local loop) which are difficult (i.e. expensive) to replicate for the rivals (see discussion by Cave and Vogelsang, 2003). On the other hand, our findings are similar, since they both demonstrate redundancy of costly regulations in similar contexts.

The paper is organized as follows. Section 2 describes the model. Sections 3 and 4 present the findings under centralized and decentralized decision making by the incumbent firm. Section 5 demonstrates the advantages of endogenous access pricing, and Section 6 concludes the paper.

2. Model

A vertically integrated incumbent firm provides an upstream component, network access, to its own downstream subsidiary and to one downstream rival. One unit of network access is required per unit of retail service provided. The inverse demand for downstream retail service is given by $p(Q)$, where $Q = q_1 + q_2$ is the sum of the incumbent and its rival's output, q_1 and q_2 are the downstream quantities sold by the incumbent and its rival, respectively. We assume $p'(Q) < 0$ and $p''(Q) \cdot 0$. Quantities and the market price are unregulated. The profit functions

of the vertically integrated incumbent and its rival are, respectively:

$$\pi_1 = p(Q)q_1 + wq_2 - c_1q_1 - F \tag{2.1}$$

$$\pi_2 = p(Q)q_2 - wq_2 - c_2q_2$$

where w is the regulated access price paid by the rival, c_1 and c_2 are per unit retail costs of the incumbent owned downstream …rm and its rival. We assume that c_1 and c_2 are independent of the output produced. F is total …xed cost of providing network access. The variable cost of providing access is normalized to zero as we wish to rule out economies of scope e¤ects for the incumbent. As we are not interested in entry issues, we ignore downstream …xed costs.[5] Furthermore, we assume that the retail services are homogeneous. Welfare is de…ned as the sum of the producer surplus and the consumer surplus.

The structure of the game is as follows. In Stage 1, the regulator announces the access price or the process of determining the access price. In Stage 2, the …rms simultaneously compete in quantities (a lá Cournot) to maximize pro…t.[6]

We assume that the regulator enforces an average cost based access price. Specifically, the regulator is successful when the …xed network cost is covered based on total downstream sales in equilibrium. We consider two di¤erent circumstances (regimes) in which this objective can be achieved; an exogenous access pricing regime and an endogenous access pricing regime.

In the exogenous access price regime, the regulator sets $w = \overline{w}$, which is perceived as exogenous by the …rms. $\overline{w} = \frac{F}{\bar{q}}$ is based on the regulator's estimate of market

[5]For a thorough discussion of entry in telecommunications, see Spulber and Sidak (1997).
[6]Mitchell and Vogelsang (1998) argue that the rival and the integrated incumbent compete "in capacity and pricing, so that Cournot pricing is most likely to result."(p. 38).

volume, $\hat{Q}$, which is determined by backward induction. This is unlikely to be the optimal access price in the class of exogenous access prices as it is constrained to equal FDC in equilibrium. Whether this occurs by "accident" or by foresight of the regulator is not the focus here. Rather, the focus is e¤ects of the regulated …rms' perception of whether this FDC-based access price is exogenous or endogenous.

In the endogenous access price regime, the regulator announces at Stage 1 that $w = \frac{E}{Q}$, where the access price is based on realized total output Q in the second stage. In practice, a tentative access price can be announced ex-ante, with the understanding that the …rms may have to pay more (or they receive money back) ex-post according to the access price determination mechanism. Hence, w becomes endogenous to both …rms. After the announcement of the access price determination mechanism, the …rms compete in quantities in Stage 2. The …rms' costs and objectives are common knowledge.

In the next sections, we analyze the outcomes under exogenous and endogenous access pricing regimes. For each scenario, we also study the outcomes under both centralized and decentralized decision making by the incumbent. Under the centralized decision making process, the incumbent acts as a fully integrated …rm. As a result, the marginal cost of the upstream input (which is access) faced by the incumbent owned downstream …rm is identical to the true marginal cost of access as incurred by the upstream …rm. In contrast, under the decentralized decision making process, the upstream …rm and the incumbent owned downstream …rm must act as two separate …rms. As a result, the marginal cost of the upstream input (which is access) faced by the incumbent owned downstream …rm is identical to the marginal cost of access that is faced by its downstream rival. Note that the 2002

EU Access Directives calls for a decentralized decision making process. Several ancillary obligations on accounting separation, transparency and non-discrimination should ensure that the incumbent's subsidiary perceives the regulated access price as the marginal cost.

3. Centralized Decision Making by the Incumbent Firm

3.1. Exogenous Access Price. Taking access price $w = \overline{w}$ as given, both firms simultaneously maximize profit. The first order conditions for the incumbent and the rival are, respectively:

$$p'(Q)q_1 + p(Q) - c_1 = 0 \tag{3.1}$$

$$p'(Q)q_2 + p(Q) - \overline{w} - c_2 = 0$$

Rearranging (3.1) we get the following equilibrium quantities:

$$q_1^{\square} = \frac{p - c_1}{p'(Q)} \tag{3.2}$$

$$q_2^{\square} = \frac{p - \overline{w} - c_2}{p'(Q)}$$

Thus, under centralized decision making, the output and profit of the integrated incumbent firm exceed those of the rival when access price is exogenous and exceeds the difference in marginal cost between the incumbent and its rival. This confirms the findings by Damania (1996) and Biglaiser and DeGraba (2001). Furthermore, we show that the result holds as long as the exogenous access price exceeds any marginal cost disadvantage the incumbent might have in the retail market, that is, $\overline{w} > (c_1 - c_2)$. The intuition is that the access price becomes part of the rival's

total marginal cost, ($\overline{w}$ + c_2). The incumbent enjoys an advantage as long as this total exceeds the incumbent's own marginal cost. The reason is that the incumbent owned downstream …rm does not face the 'double marginalization' problem that is faced by its rival. Thus, there exists an arti…cial cost advantage to the incumbent as long as $\overline{w} > 0$, i.e. the access price exceeds the upstream marginal cost.

Note that the regulator sets the access price at Stage 1 such that in equilibrium in Stage 2 we get $\overline{w} = \frac{F}{q_1^{\square} + q_2^{\square}}$. Inserting $\overline{w} = \frac{F}{q_1^{\square} + q_2^{\square}}$ into the equilibrium quantities in (3.1), and solving the following two equations, we get $q_1^{\square}, q_2^{\square}$ and $\overline{w} = \frac{F}{q_1^{\square} + q_2^{\square}}$.

(3.3)
$$p^{\prime}(Q)q_1 + p(Q) - c_1 = 0$$
$$p^{\prime}(Q)q_2 + p(Q) - \frac{F}{Q} - c_2 = 0$$

Note that the equations in (3.3) result in two average cost based access price equilibriums; one yielding a high and one yielding a low access price. The low access price equilibrium results in higher welfare, higher pro…ts, and lower prices and would hence be preferred by the regulator, …rms and consumers. Here and in the rest of the paper, whenever multiple equilibria arise, we consider the equilibrium with the lowest access price.

3.2. Endogenous Access Price. Next, we turn to the case where in Stage 1, the regulator announces the mechanism to determine the access price. Here, the regulator announces that the access price w will be set at $\frac{F}{q_1 + q_2}$. Hence, the access price becomes endogenous to the …rms when they compete at Stage 2. Rewriting

the …rms' pro…t functions in (3.1) in terms of the endogenous access price, we get:

$$\pi_1 = p(Q)q_1 + w(Q)q_2 - c_1 - F \tag{3.4}$$

$$\pi_2 = p(Q)q_2 - w(Q)q_2 - c_2$$

The corresponding …rst order conditions are:

$$p'(Q)q_1 + p(Q) + w'(Q)q_2 - c_1 = 0 \tag{3.5}$$

$$p'(Q)q_2 + p(Q) - w'(Q)q_2 - w(Q) - c_2 = 0$$

Substituting for $w(Q)$ and $w'(Q)$, and rearranging terms, we get:

$$p'(Q)q_1 + p(Q) - \frac{F}{(q_1 + q_2)^2}(q_2) - c_1 = 0 \tag{3.6}$$

$$p'(Q)q_2 + p(Q) - \frac{F}{(q_1 + q_2)^2}(q_1) - c_2 = 0$$

Proposition 1 below follows directly from equation (3.6) :

Proposition 1. Under centralized decision making and endogenous access pricing, there will be no arti…cial cost advantage. Di¤erences in outputs between the incumbent owned downstream …rm and the rival are based on their respective downstream marginal costs.

The intuition behind Proposition 1 is as follows. An increase in output by one of the …rms increases its market share and hence its share of …xed cost. Since this e¤ect is symmetric, the incumbent …rm loses the arti…cial cost advantage it enjoyed under exogenous access pricing. The outcome is related to Sappington (2005) in the context of the irrelevance of input prices for make or buy access decisions by an

entrant. In Sappington's model a high access price leads the vertically integrated …rm to engage in less aggressive downstream competition. This is due to a high opportunity cost of downstream success. In our framework there will also be an opportunity cost of expanded output, since this will reduce the access price. However, there will be an additional e¤ect as the rival also bene…ts from increasing its output to reduce the access price.

3.3. Comparisons of outcomes under exogenous and endogenous access prices. We now compare the equilibrium outcomes under endogenous and exogenous access pricing. Summation of the …rst order conditions in equation (3.6) yields the following equilibrium condition when access price is considered endogenous:

$$p'(\hat{Q}^{e})\hat{Q}^{e} + 2p\left(\hat{Q}^{e}\right) - \frac{F}{\hat{Q}^{e}} = c_1 + c_2 \tag{3.7}$$

where $\hat{Q}^{e}$ denotes the aggregate output under endogenous access pricing.

Similarly, substituting $\overline{w} = \frac{F}{\hat{Q}^{n}}$ into the exogenous access pricing equilibrium conditions in (3.1) and summing the …rst order conditions, we get:

$$p'(\hat{Q}^{n})\hat{Q}^{n} + 2p\left(\hat{Q}^{n}\right) - \frac{F}{\hat{Q}^{n}} = c_1 + c_2 \tag{3.8}$$

where $\hat{Q}^{n}$ denotes the aggregate output under exogenous access pricing.

Note that equations (3.7) and (3.8) are identical, giving rise to the following proposition:

Proposition 2. With centralized decision making by the incumbent …rm, the total quantity and the market price under endogenous access pricing are identical to those under exogenous access pricing.

This result is similar to a two-way access result by Economides et al. (1996). Investigating the consequences of three different interconnect regulations – reciprocity of termination charges, imputation and unbundling – they find that all three tend to neutralize dominance and profit differences in a network duopoly.

We now compare welfare under endogenous and exogenous access pricing. Since the total quantity under endogenous access pricing are identical to that under exogenous access pricing, the welfare is larger in the scenario in which more output is produced by the more efficient firm. The following proposition follows by noting that when the access price is exogenous, the incumbent owned downstream firm produces relatively more.

Proposition 3. With centralized decision making by the incumbent firm, if $c_1 < c_2$, then the welfare under endogenous access pricing is smaller than that under exogenous access pricing. If $c_1 = c_2$, then the welfare is identical under both access pricing regimes. If $c_1 > c_2$, the welfare under endogenous access pricing is higher than that under exogenous access pricing.

4. Decentralized Decision Making by the Incumbent Firm

As discussed in the Introduction, the cost oriented access regulation often includes additional regulatory measures to ensure non-discrimination, such as transparency and accounting separation. In this section, we assume that the vertically integrated firm reorganizes into upstream headquarters (HQ) providing network access and a downstream subsidiary providing service in competition with the rival. Simultaneously, decision making is decentralized. Based on homogeneity downstream, the non-discrimination obligation implies that the HQ must offer access on identical terms to both downstream firms. The downstream subsidiary maximizes

pro…t while treating w as its marginal cost just like the rival does. The role of the HQ is trivial in our case as it simply passes on the access price to the downstream …rms. Thus, the regulator needs to ensure that the downstream unit of the vertically integrated …rm ignores upstream pro…t when it decides the retail price.[7]

When decision making by the downstream …rm is decentralized, we get symmetrical downstream pro…t functions:

$$\pi_i = p(Q)q_i - wq_i - c_i \text{ where } i = 1, 2 \tag{4.1}$$

4.1. Exogenous Access Price. Next, we consider the case where access price is perceived as exogenous by the …rms. It can be veri…ed that the …rst order conditions for pro…t maximization are:

$$p'(Q)q_1 + p(Q) - \frac{F}{Q} - c_1 = 0 \tag{4.2}$$
$$p'(Q)q_2 + p(Q) - \frac{F}{Q} - c_2 = 0$$

Adding the …rst order conditions in equation (4.2), we obtain:

$$p'(Q)Q + 2p(Q) - \frac{2F}{Q} - (c_1 + c_2) = 0 \tag{4.3}$$

Next, we investigate the impact of decentralized decision making, given that access price is perceived as exogenous by the …rms. When decision making by the incumbent …rm is centralized, the equilibrium output are given by equation (3.1).

[7] In practice, it may be di¢cult for the regulator to prevent the incumbent from using an incentive to the downstream manager based on the overall pro…t (see Mandy, 2001, and Foros, Kind and Sørgard, 2005). However, as will be shown below, the organizational structure does not matter under endogenous access pricing.

Adding the two …rst order conditions in equation (3.1) , we obtain:

$$p'(Q)Q + 2p(Q) - \frac{F}{Q} - (c_1 + c_2) = 0 \tag{4.4}$$

From equations (4.3) and (4.4) , we obtain that under exogenous access pricing, decentralized decision making matters. Decentralized decision making leads to a higher access price and lower quantity. Furthermore, under exogenous access pricing and $c_1 \neq c_2$, then decentralized decision making by the incumbent …rm results in a lower welfare. This supports earlier cautions about possible negative consequences from decentralized decision making put forth by Biglaiser and DeGraba (2001) and DeGraba (2003).

4.2. Endogenous Access Price. As in the previous section, the regulator announces at Stage 1 that the access price w will be set at $\frac{F}{q_1+q_2}$. Hence, the access price becomes endogenous to the …rms when they compete in Stage 2. Therefore, the …rst order conditions for pro…t maximization are:

$$p'(Q)q_i + p(Q) + \frac{F}{(q_1 + q_2)^2}q_i - \frac{F}{(q_1 + q_2)} - c_i = 0 \tag{4.5}$$

$$\Rightarrow \quad p'(Q)q_i + p(Q) - \frac{F}{(q_1 + q_2)^2}q_j - c_i = 0 \text{ where } i \neq j = 1, 2$$

Comparing equations (3.6) and (4.5), we establish that with endogenous access pricing, outcomes under decentralized decision making are identical to those under centralized decision making.

Proposition 4. With endogenous access pricing, individual …rm quantities, total output, market price and welfare under decentralized decision making are identical to those under centralized decision making.

Put di¤erently, under endogenous access pricing, the organizational structure of the incumbent does not matter. The intuition is that the symmetry in how …xed network costs are allocated is una¤ected by the vertical structure of the incumbent. When vertically separated, the HQ's role is insigni…cant since the access price w will be set at $\frac{F}{q_1+q_2}$ and the downstream subsidiary will act accordingly. Nothing changes when the incumbent is integrated. Due to this insigni…cance of vertical structure, summing the …rst order conditions in (4.5) simply reproduces (3.7).

4.3. Comparisons of outcomes under exogenous and endogenous access prices. Given decentralized decision making, a comparison of outcomes under exogenous and endogenous access prices requires a comparison between equations (4.3) and (3.7). which leads to the following proposition.

Proposition 5. With decentralized decision making by the incumbent …rm, (i) the total quantity under endogenous access pricing is higher than under exogenous access pricing, and furthermore (ii) if $c_2 \cdot c_1$, welfare is also higher.

What begs a question is then, why do we not observe endogenous access pricing rules in practice? Our claim is that such rules should be quite easy to implement through some end of the year rebates contingent on the realized volumes. In unregulated markets, e.g. the grocery industry, we observe that di¤erent types of buy-back clauses are used, such that the input price depends on the realized volumes ex post. However, if one of the …rms fears that the other part will go bankrupt, or for other reason may not ful…l the agreement, such contracts will loose their appeal. This may be a main reason why we have not observed such contract on access pricing. In particular, the access providers have been sceptical. One reason is that their pro…t is higher, other things equal, under exogenous average cost based access pricing due

to the arti…cial cost advantage. Furthermore, they fear that this may be a one-way compensation, such that the regulated …rm has to pay compensation when volumes ex post are higher than estimated. The access provider will not be able to obtain end of the year compensation if the volumes is below what was estimated. Therefore, active involvements of the appropriate and relevant authorities are needed to implement endogenous access pricing. Proper access pricing guidelines, backed by appropriate authorities, should lessen the access provider's concerns.

5. Advantages of Endogenous Access Pricing

In this section, we present the advantages of endogenous access pricing. As stated in Proposition (1), endogenous access pricing neutralizes the advantage enjoyed by an incumbent …rm making centralized decisions. With endogenous access pricing, the market shares and the pro…ts of the …rms are identical. Therefore, with endogenous access pricing, the regulators do not need to worry about enforcing a non-discrimination obligation and an accounting separation obligation, as stated in Articles 10 and 11 of 2002 European Union Access Directives. Also, Propositions (2) and (5) state that the aggregate quantity under endogenous access pricing is at least as large as the aggregate quantity under exogenous access pricing. Hence, the consumer surplus is equal or higher under endogenous access pricing. Furthermore, from Propositions (3) and (5), it follows that if $c_2 \cdot c_1$, then the welfare under endogenous access pricing is at least as large as the welfare under exogenous access pricing. Di¤usion of technology and/or higher likelihood of adaptation of superior technology by the later entrant justify the condition $c_2 \cdot c_1$.

Proposition (6) below summarizes the above discussions and highlights the advantages of an endogenous access pricing:

Proposition 6. Irrespective of centralized or decentralized decision making by the incumbent …rm, (i) the aggregate quantity and the consumer surplus under endogenous access pricing are equal to or larger than those under exogenous access pricing. (ii) endogenous access pricing neutralizes the arti…cial advantage that is otherwise enjoyed by the incumbent …rm, (iii) if $c_2 \cdot c_1$, then the welfare under endogenous access pricing is equal to or larger than the welfare under exogenous access pricing.

6. Conclusion

In this paper, we propose and analyze an endogenous average cost based access pricing rule. The existing literature on access pricing has always used exogenous access pricing, where the access price is …xed ex-ante. Despite the presence of more sophisticated rules such as Ramsey pricing or the E¢cient Component Pricing Rule (ECPR), the average cost based rules dominate in practice. Fully distributed cost (FDC) based exogenous access pricing has been commonly used in the telecommunications industry. Long run average incremental cost (LRAIC) is now being considered as an alternative. However, both result in an access price based on some ex ante average cost.

We argue that an endogenous access pricing rule can be easily implemented in practice. A simple option of adjusting the access price ex-post transforms an exogenous access pricing regime to an endogenous access pricing regime. A tentative access price can be announced ex-ante, with the understanding that a …rm may have to pay more (or it may receives money back) ex-post according to the access price determination mechanism. Under complete information, a tentative access price can easily be computed ex-ante, such that it would be identical to the ex-post access price, and therefore, the …rms would pay or receive nothing ex-post.

We demonstrate that an endogenous access pricing has signi…cant advantages over an exogenous access pricing: (i) the aggregate quantity and the consumer surplus under endogenous access pricing are equal to or larger than those under exogenous access pricing. (ii) endogenous access pricing neutralizes the arti…cial cost advantage that is otherwise enjoyed by the incumbent …rm. (iii) if the entrant is as e¢cient as the incumbent …rm, then the welfare under endogenous access pricing is equal to or larger than the welfare under exogenous access pricing. Furthermore, we show that costly ancillary obligations, such as accounting separation, transparency, and non-discrimination, can be avoided by adopting an endogenous access pricing rule.

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